

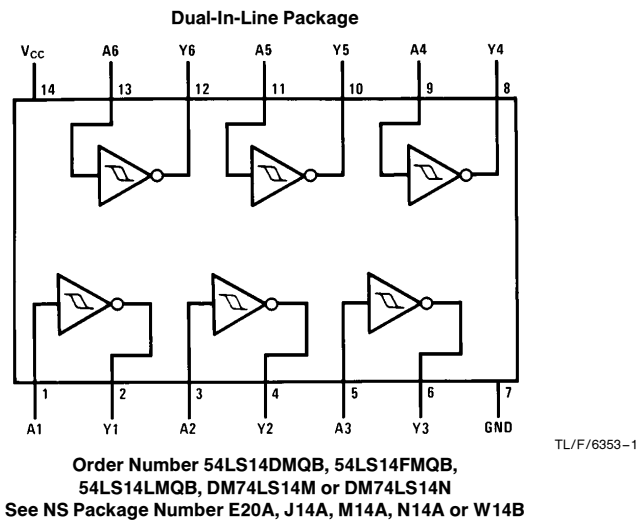
June 1989

# 54LS14/DM74LS14 Hex Inverters with Schmitt Trigger Inputs

## General Description

This device contains six independent gates each of which performs the logic INVERT function. Each input has hysteresis which increases the noise immunity and transforms a slowly changing input signal to a fast changing, jitter free output.

## Connection Diagram



## Function Table

$Y = \overline{A}$

Input	Output
A	Y
L	H
H	L

H = High Logic Level  
 L = Low Logic Level

54LS14/DM74LS14 Hex Inverters with Schmitt Trigger Inputs

## Absolute Maximum Ratings (Note)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Supply Voltage	7V
Input Voltage	7V
Operating Free Air Temperature Range	
54LS	−55°C to +125°C
DM74LS	0°C to +70°C
Storage Temperature Range	−65°C to +150°C

Note: The “Absolute Maximum Ratings” are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the “Electrical Characteristics” table are not guaranteed at the absolute maximum ratings. The “Recommended Operating Conditions” table will define the conditions for actual device operation.

## Recommended Operating Conditions

Symbol	Parameter	54LS14			DM74LS14			Units
		Min	Nom	Max	Min	Nom	Max	
V <sub>CC</sub>	Supply Voltage	4.5	5	5.5	4.75	5	5.25	V
V <sub>T+</sub>	Positive-Going Input Threshold Voltage (Note 1)	1.5	1.6	2.0	1.4	1.6	1.9	V
V <sub>T−</sub>	Negative-Going Input Threshold Voltage (Note 1)	0.6	0.8	1.1	0.5	0.8	1	V
HYS	Input Hysteresis (Note 1)	0.4	0.8		0.4	0.8		V
I <sub>OH</sub>	High Level Output Current			−0.4			−0.4	mA
I <sub>OL</sub>	Low Level Output Current			4			8	mA
T <sub>A</sub>	Free Air Operating Temperature	−55		125	0		70	°C

## Electrical Characteristics over recommended operating free air temperature range (unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ (Note 2)	Max	Units
V <sub>I</sub>	Input Clamp Voltage	V <sub>CC</sub> = Min, I <sub>I</sub> = −18 mA			−1.5	V
V <sub>OH</sub>	High Level Output Voltage	V <sub>CC</sub> = Min, I <sub>OH</sub> = Max V <sub>IL</sub> = Max	54LS 2.5 DM74 2.7	3.4 3.4		V
V <sub>OL</sub>	Low Level Output Voltage	V <sub>CC</sub> = Min, I <sub>OL</sub> = Max V <sub>IH</sub> = Min	54LS DM74	0.25 0.35	0.4 0.5	V
		V <sub>CC</sub> = Min, I <sub>OL</sub> = 4 mA	DM74	0.25	0.4	
I <sub>T+</sub>	Input Current at Positive-Going Threshold	V <sub>CC</sub> = 5V, V <sub>I</sub> = V <sub>T+</sub>	DM74	−0.14		mA
I <sub>T−</sub>	Input Current at Negative-Going Threshold	V <sub>CC</sub> = 5V, V <sub>I</sub> = V <sub>T−</sub>	DM74	−0.18		mA
I <sub>I</sub>	Input Current @ Max Input Voltage	V <sub>CC</sub> = Max, V <sub>I</sub> = 7V V <sub>CC</sub> = Max, V <sub>I</sub> = 10.0V	DM74 54LS		0.1	mA
I <sub>IH</sub>	High Level Input Current	V <sub>CC</sub> = Max, V <sub>I</sub> = 2.7V			20	μA
I <sub>IL</sub>	Low Level Input Current	V <sub>CC</sub> = Max, V <sub>I</sub> = 0.4V			−0.4	mA
I <sub>OS</sub>	Short Circuit Output Current	V <sub>CC</sub> = Max (Note 3)	54LS DM74	−20 −20	−100 −100	mA
I <sub>CCH</sub>	Supply Current with Outputs High	V <sub>CC</sub> = Max		8.6	16	mA
I <sub>CCL</sub>	Supply Current with Outputs Low	V <sub>CC</sub> = Max		12	21	mA

Note 1: V<sub>CC</sub> = 5V.

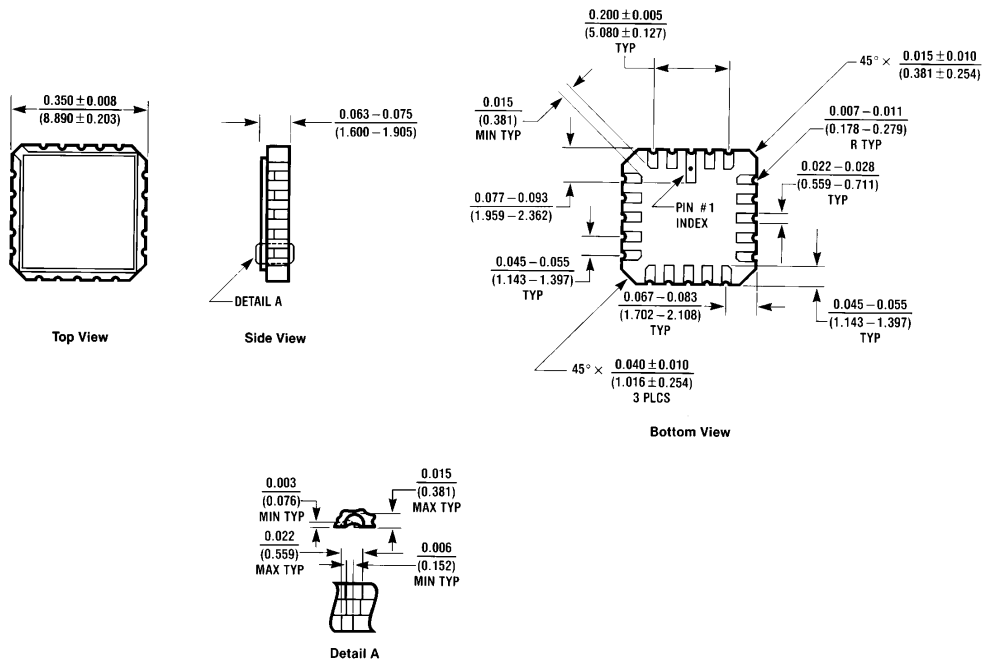
Note 2: All typicals are at V<sub>CC</sub> = 5V, T<sub>A</sub> = 25°C.

Note 3: Not more than one output should be shorted at a time, and the duration should not exceed one second.

**Switching Characteristics** at  $V_{CC} = 5V$  and  $T_A = 25^\circ C$  (See Section 1 for Test Waveforms and Output Load)

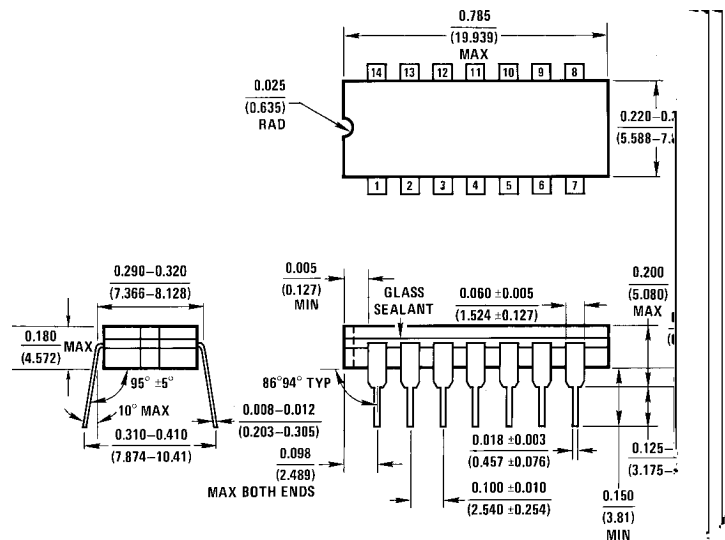
Symbol	Parameter	R <sub>L</sub> = 2 kΩ				Units
		C <sub>L</sub> = 15 pF		C <sub>L</sub> = 50 pF		
		Min	Max	Min	Max	
t <sub>PLH</sub>	Propagation Delay Time Low to High Level Output	5	22	8	25	ns
t <sub>PHL</sub>	Propagation Delay Time High to Low Level Output	5	22	10	33	ns

## Physical Dimensions inches (millimeters)



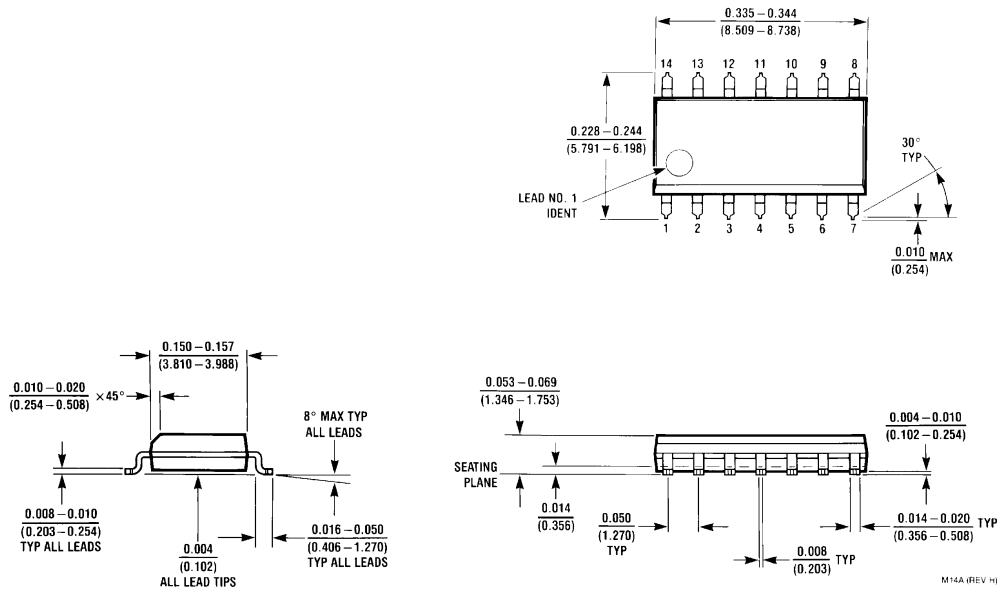
**Ceramic Leadless Chip Carrier (E)**  
Order Number 54LS14LMQB  
NS Package Number E20A

E20A (REV D)

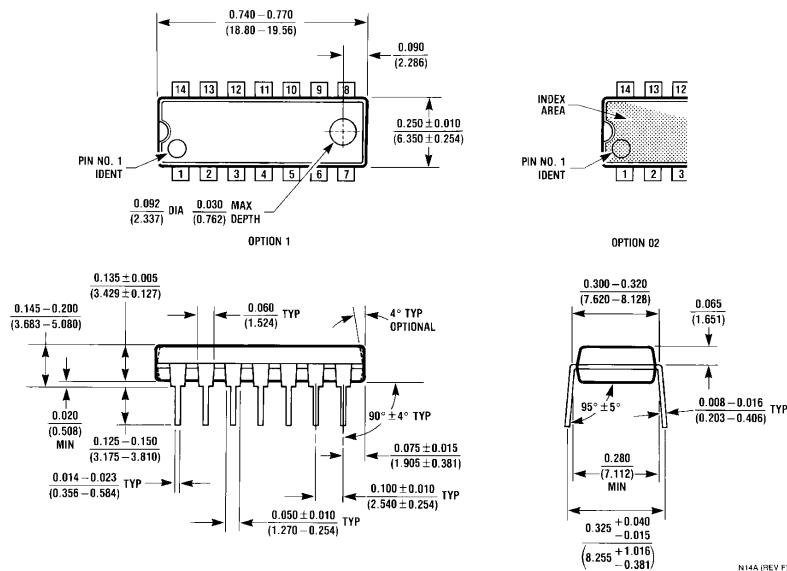


**14-Lead Ceramic Dual-In-Line Package (J)**  
Order Number 54LS14DMQB  
NS Package Number J14A

# Physical Dimensions inches (millimeters) (Continued)

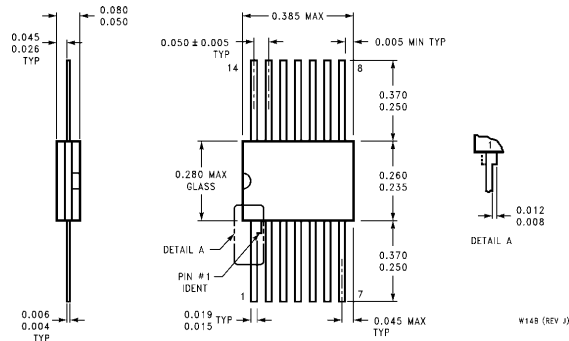


**14-Lead Small Outline Molded Package (M)**  
**Order Number DM74LS14M**  
**NS Package Number M14A**



**14-Lead Molded Dual-In-Line Package (N)**  
**Order Number DM74LS14N**  
**NS Package Number N14A**

Physical Dimensions inches (millimeters) (Continued)



14-Lead Ceramic Flat Package (W)  
Order Number 54LS14FMQB  
NS Package Number W14B

LIFE SUPPORT POLICY

NATIONAL'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF NATIONAL SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and whose failure to perform, when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.



**National Semiconductor Corporation**  
1111 West Bardin Road  
Arlington, TX 76017  
Tel: 1(800) 272-9959  
Fax: 1(800) 737-7018

**National Semiconductor Europe**  
Fax: (+49) 0-180-530 85 86  
Email: cnjwge@tevm2.nsc.com  
Deutsch Tel: (+49) 0-180-530 85 85  
English Tel: (+49) 0-180-532 78 32  
Français Tel: (+49) 0-180-532 93 58  
Italiano Tel: (+49) 0-180-534 16 80

**National Semiconductor Hong Kong Ltd.**  
19th Floor, Straight Block,  
Ocean Centre, 5 Canton Rd.  
Tsimshatsui, Kowloon  
Hong Kong  
Tel: (852) 2737-1600  
Fax: (852) 2736-9960

**National Semiconductor Japan Ltd.**  
Tel: 81-043-299-2309  
Fax: 81-043-299-2408

National does not assume any responsibility for use of any circuitry described, no circuit patent licenses are implied and National reserves the right at any time without notice to change said circuitry and specifications.